AMENDMENTS TO THE DRAWINGS

As stated below, Applicant has requested to amend Figures 1e, 4, 5, 6, 8, 10, and 14 to correct clerical errors, as shown in the attached copies of the figures labeled "Annotated Sheet Showing Changes" wherein the corrections are indicated with red ink.

REQUEST FOR APPROVAL OF DRAWING CHANGES

The amendment requested herein is to correct clerical errors of Figures 1e, 4, 5, 6, 8, 10, and 14 as shown with red ink in the attached copies of the figures labeled "Annotated Sheet Showing Changes". That is, Figure 1e has been amended to indicate an arrowhead which was missing. Figures 4, 5, and 6 have been amended to match the numerals and the words indicating the same structures. Figures 8, 10, and 14 have been amended to clarify a selection at step I (page 16, lines 3-5 of the specification, for example). No new matter has been added. Replacement Sheets are enclosed herein. Approval of this amendment is respectfully requested.

Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
KAJI, et al.
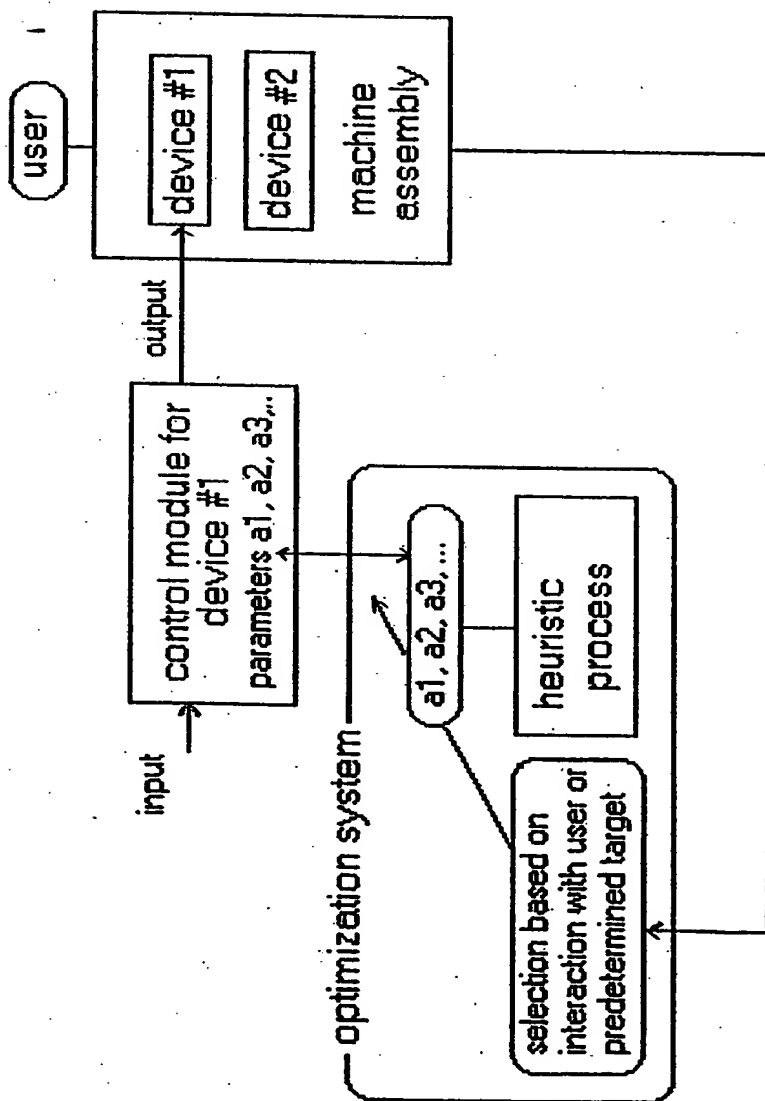*Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A*

Fig. 1a

Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
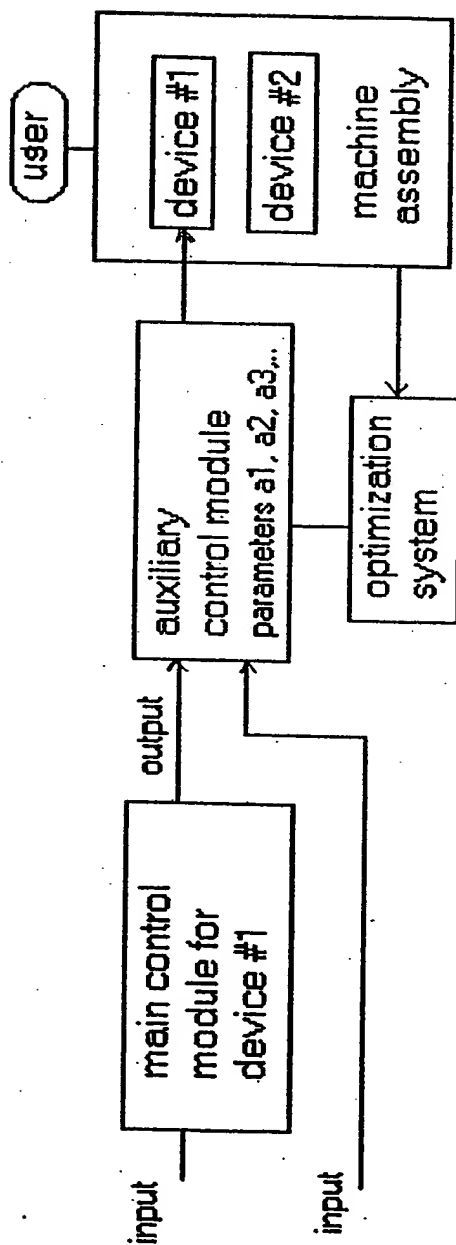*KAJI, et al.*
Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A

Fig. 1b

input

main control
module for
device #1

output

input

auxiliary
control module
parameters a1, a2, a3...

optimization
system

user

device #1

device #2

machine
assembly

Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
KAJI, et al.
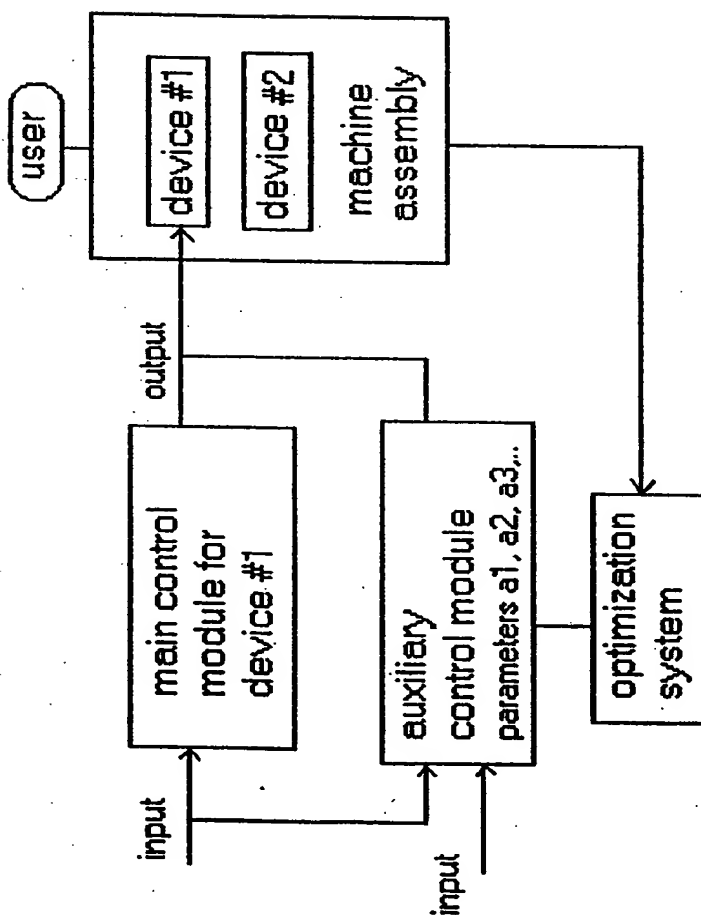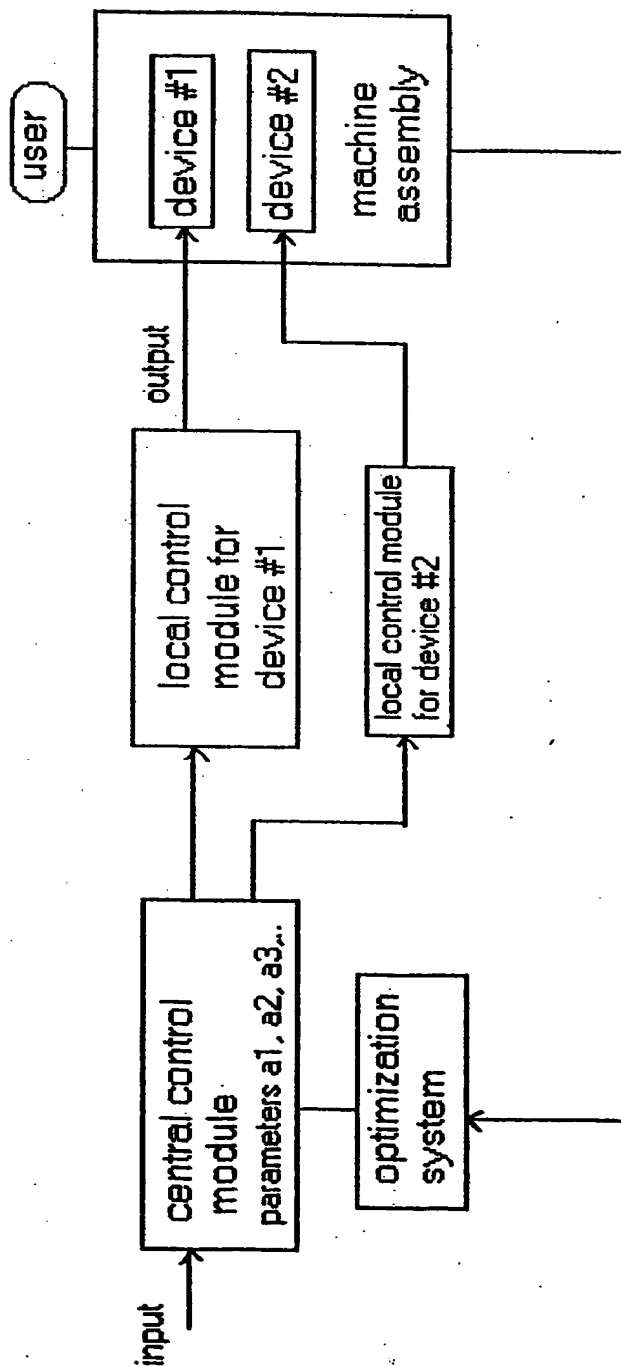Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A

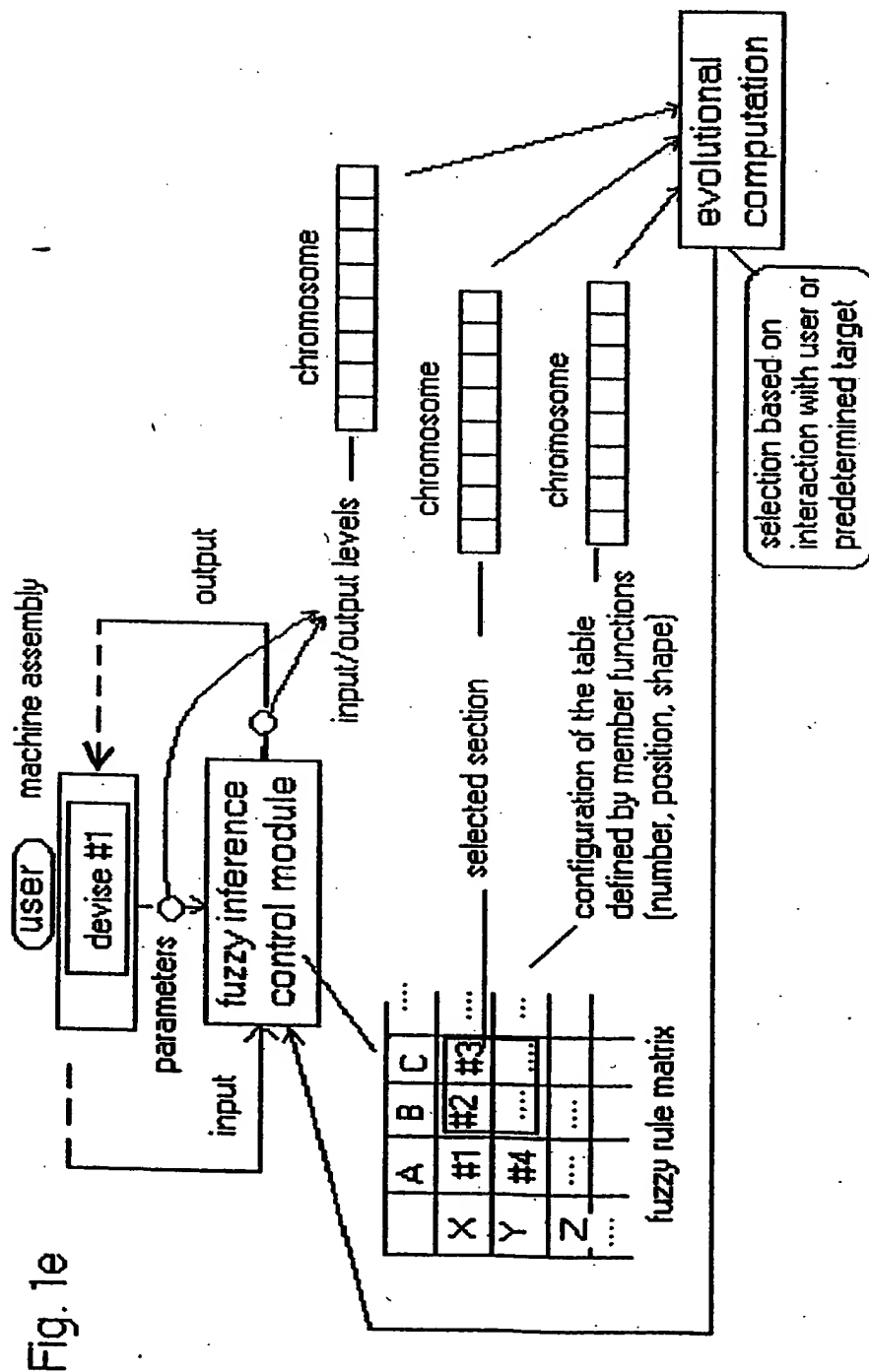Fig. 1c

Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
KAJI, et al.
Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A

Fig. 1d

Replacement Sheet

*APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY*
KAJI, et al.
Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A

Fig. 1e

Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
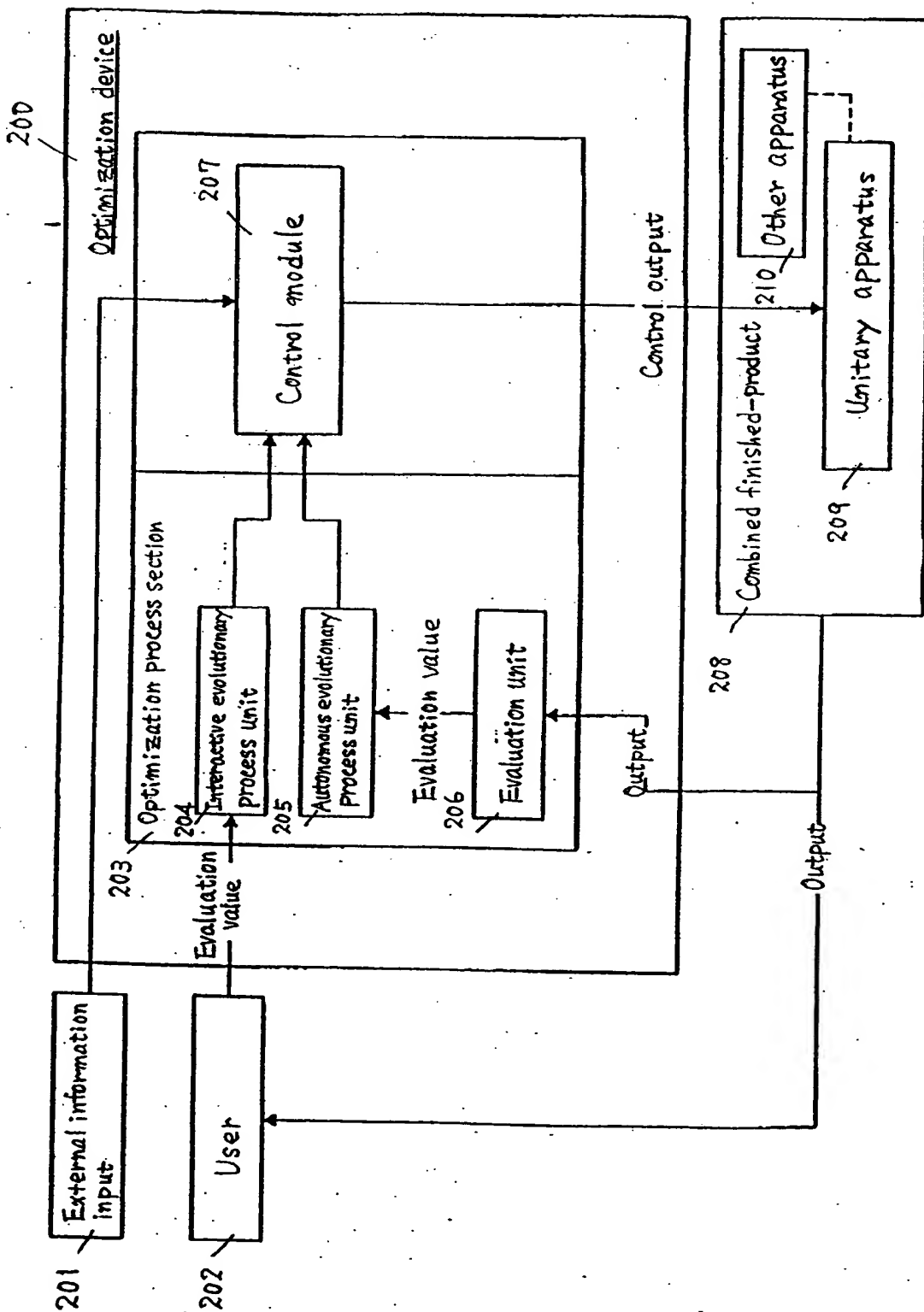KAJI, et al.
Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A

FIG. 2

32
33
34
31
36
35
37

Engine speed

Speed, Acceleration

Steering angle

Throttle opening

Evaluation value

30

Control device

Trim angle variation

Electronic throttle valve opening variation

F I G. 3

Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
KAJI, et al.
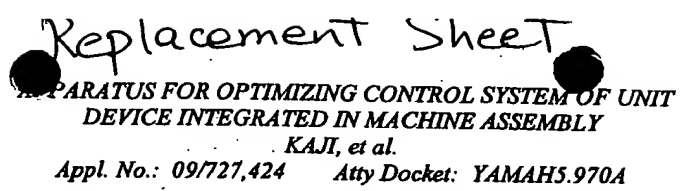Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A

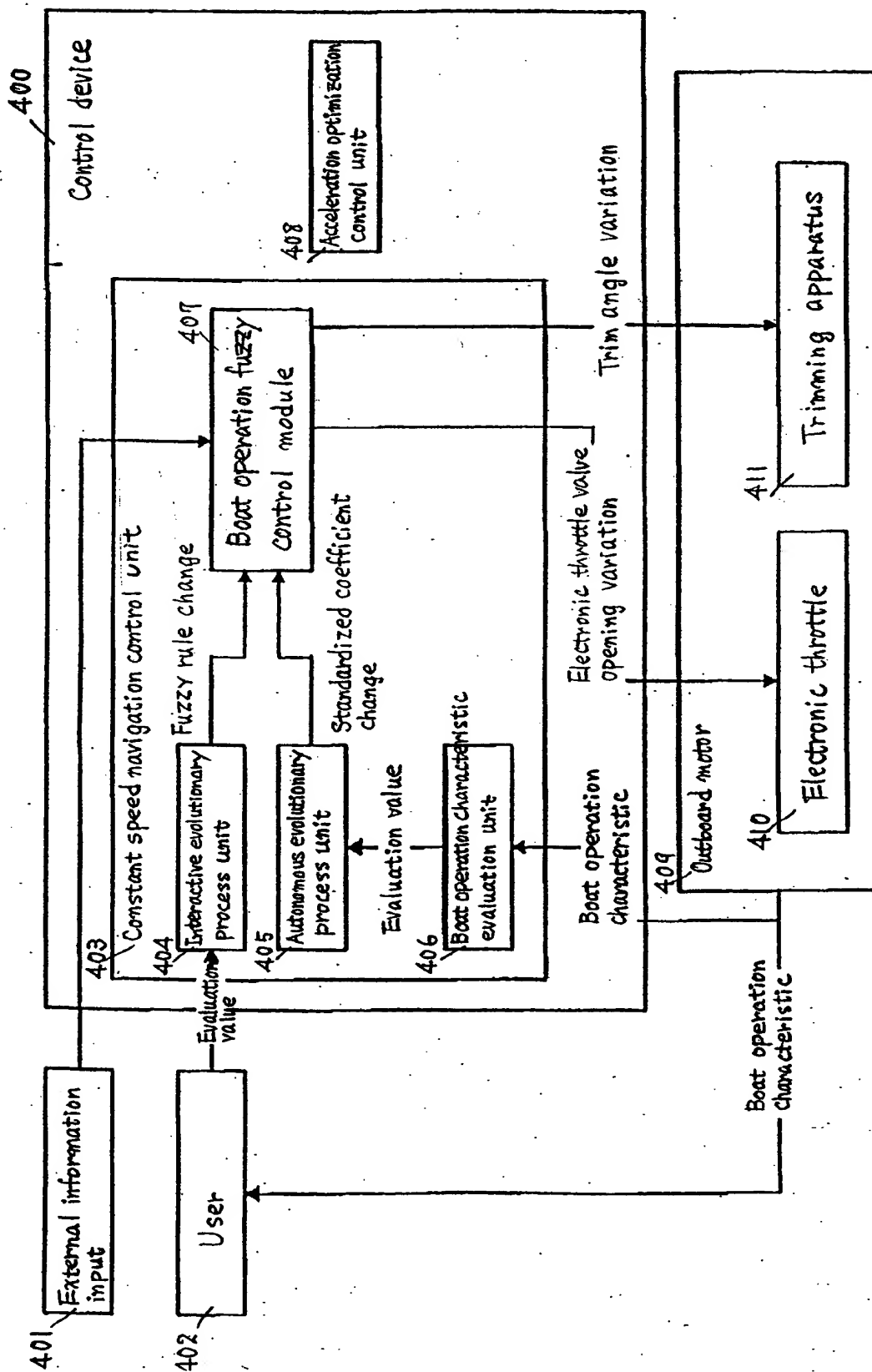FIG. 4

Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
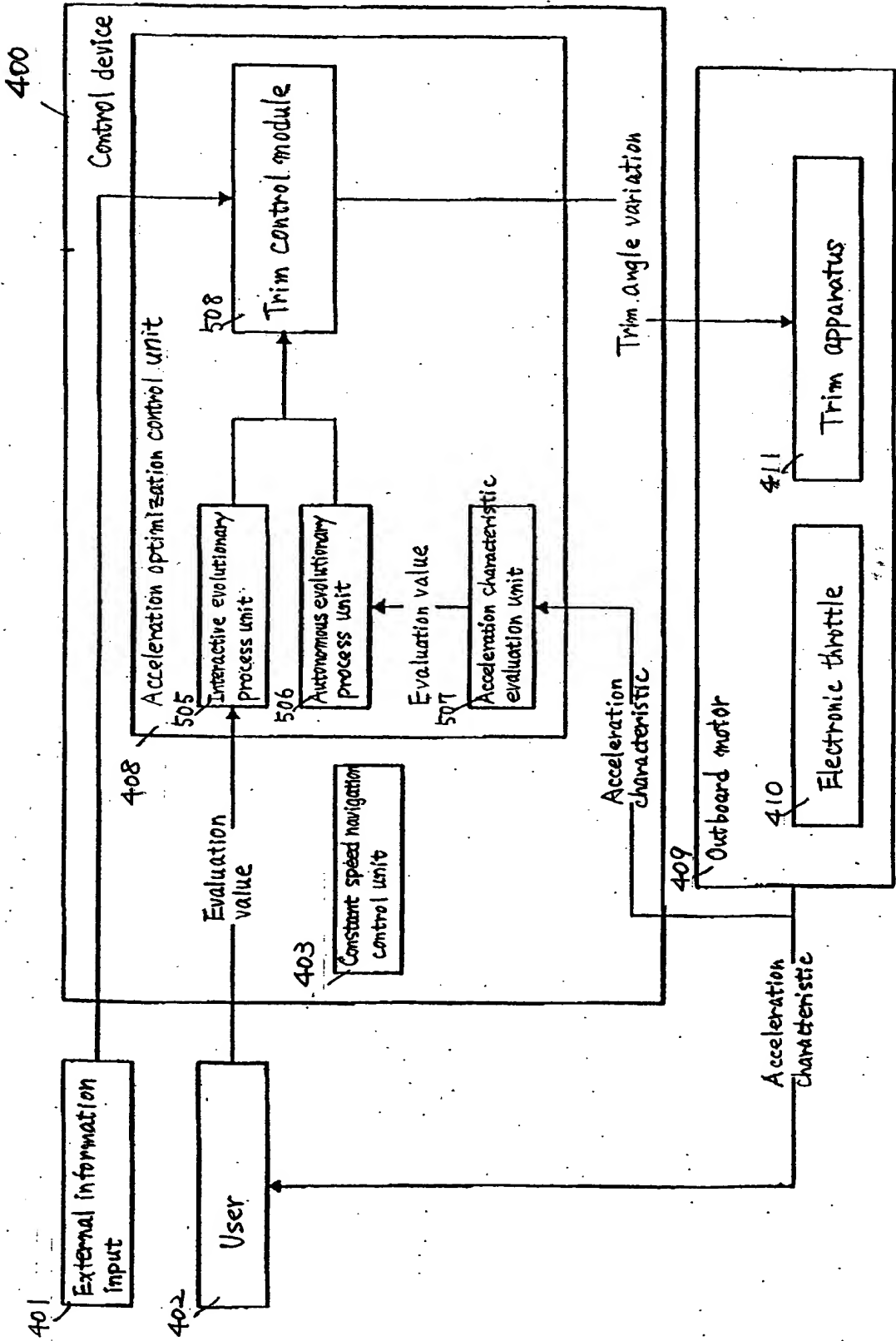KAJI, et al.
Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A

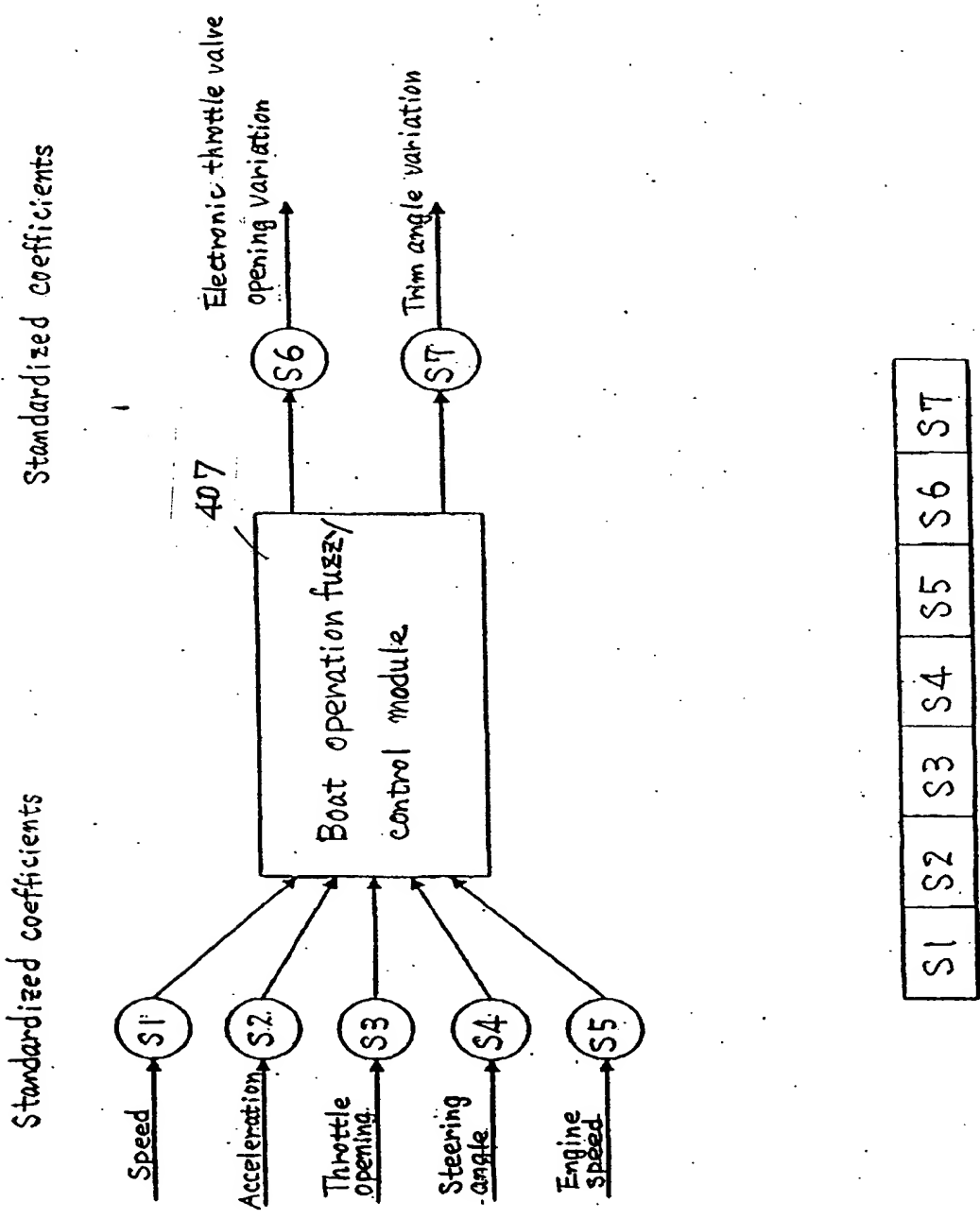400 Control device

408 Acceleration optimization control unit

505 Interactive evolutionary process unit

506 Autonomous evolutionary process unit

507 Acceleration characteristic evaluation unit
Evaluation value

508 Trim control module

403 Constant speed navigation control unit
Evaluation value

401 External information input

402 User

409 Outboard motor

410 Electronic throttle

411 Trim apparatus

Trim angle variation

Acceleration characteristic

Acceleration characteristic

FIG. 5

FIG. 6

Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
KAJI, et al.
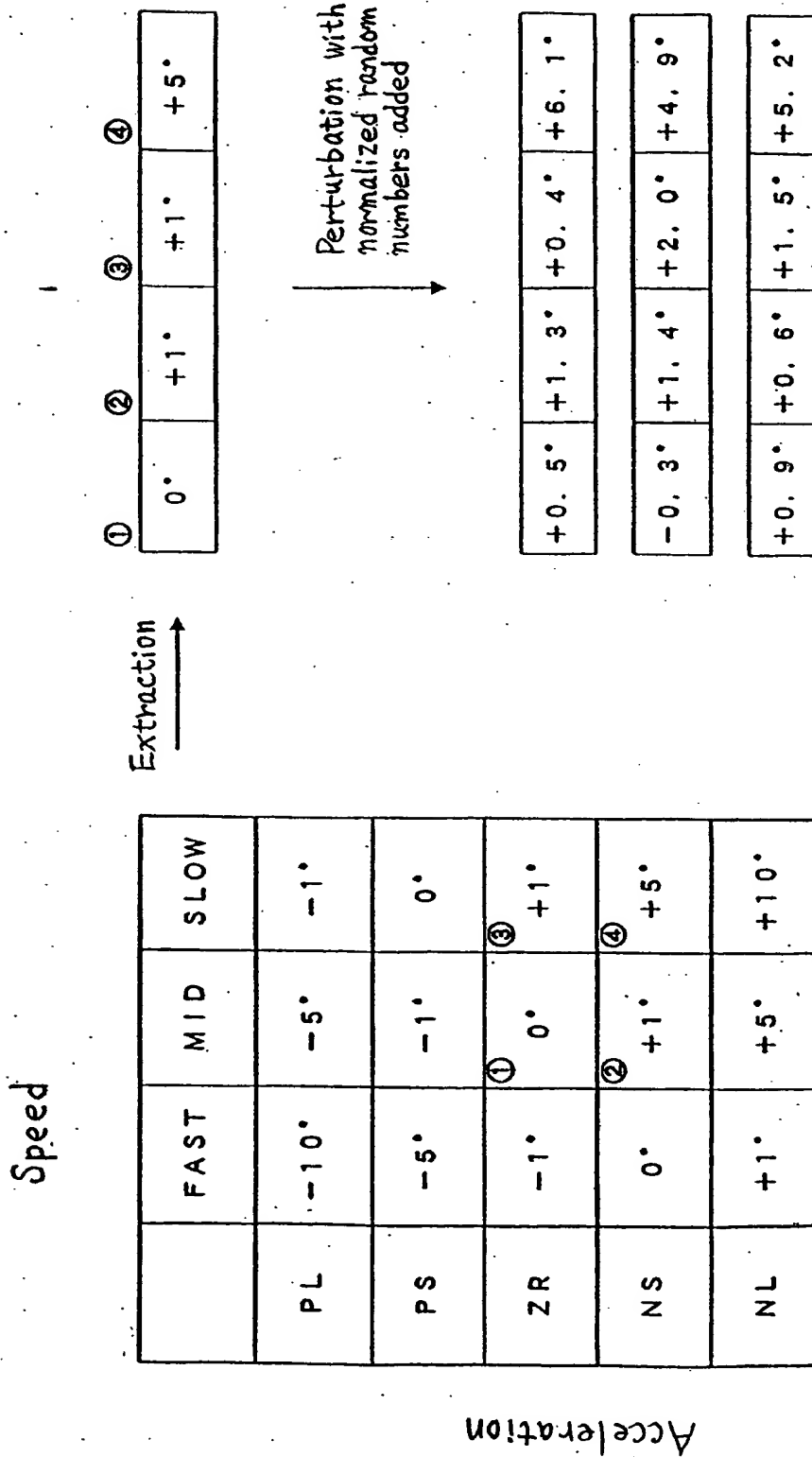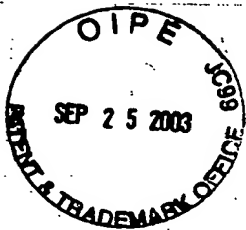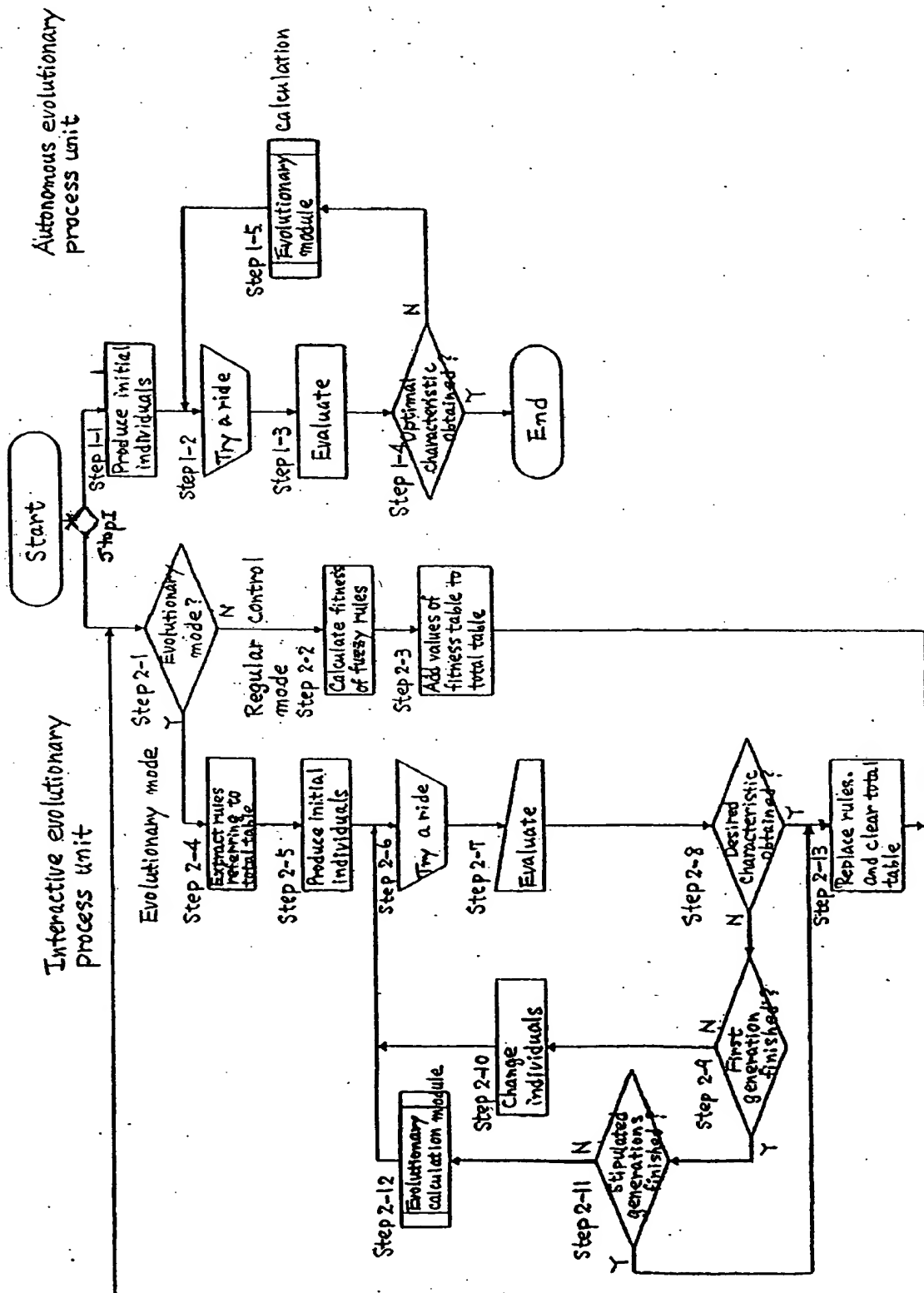Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A

Extraction

Perturbation with
normalized random
numbers added

① 0°   ② +1°   ③ +1°   ④ +5°

+0.5° +1.3° +0.4° +6.1°

−0.3° +1.4° +2.0° +4.9°

+0.9° +0.6° +1.5° +5.2°

• • •

Speed

	FAST	MID	SLOW
PL	−10°	−5°	−1°
PS	−5°	−1°	0°
ZR	−1°	① 0°	③ +1°
NS	0°	② +1°	④ +5°
NL	+1°	+5°	+10°

Acceleration

Fuzzy rule table

input : Speed, Acceleration
output : Electronic throttle valve
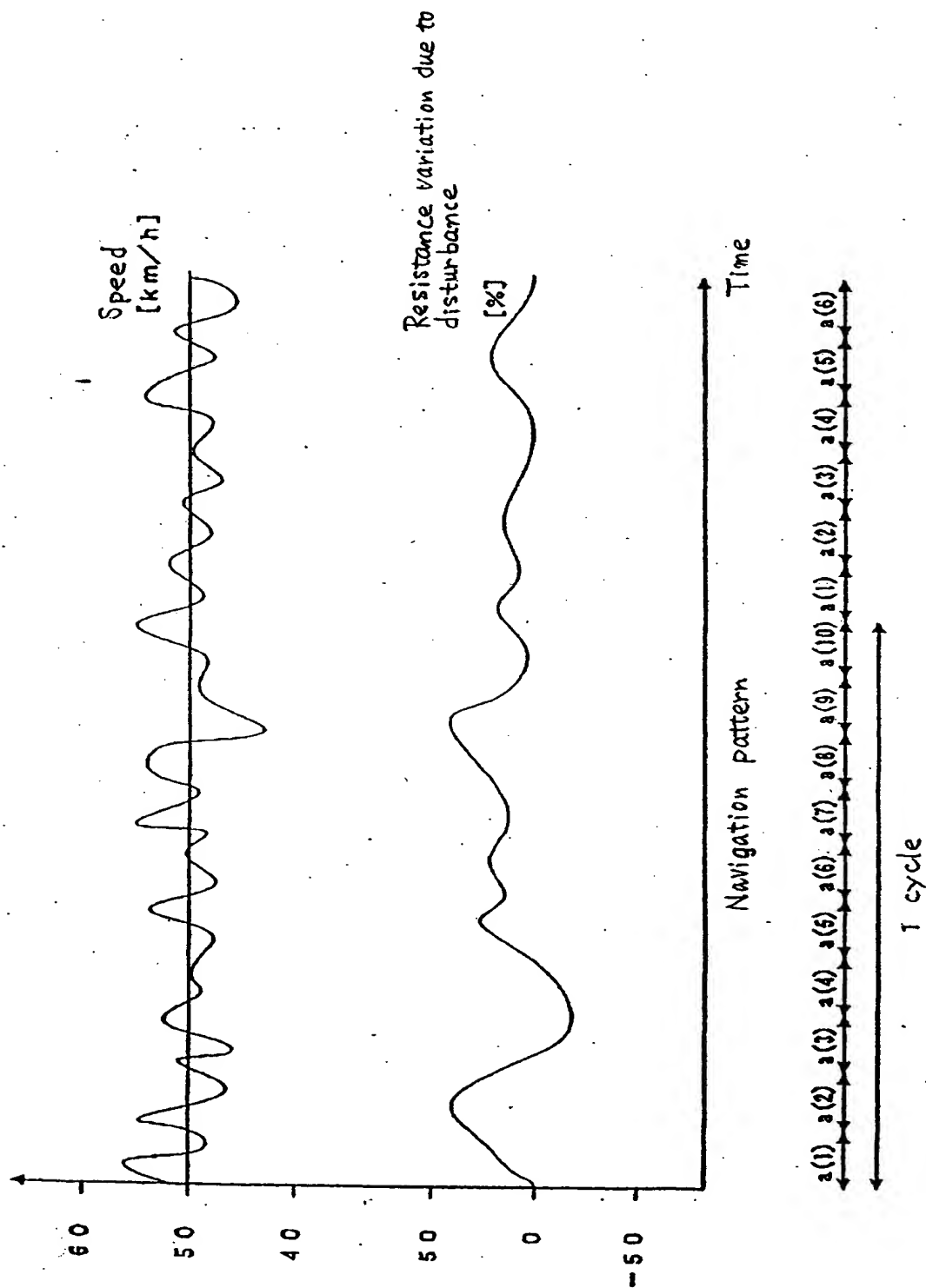opening variable

FIG. 7

FIG. 8

'Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
KAJI, et al.
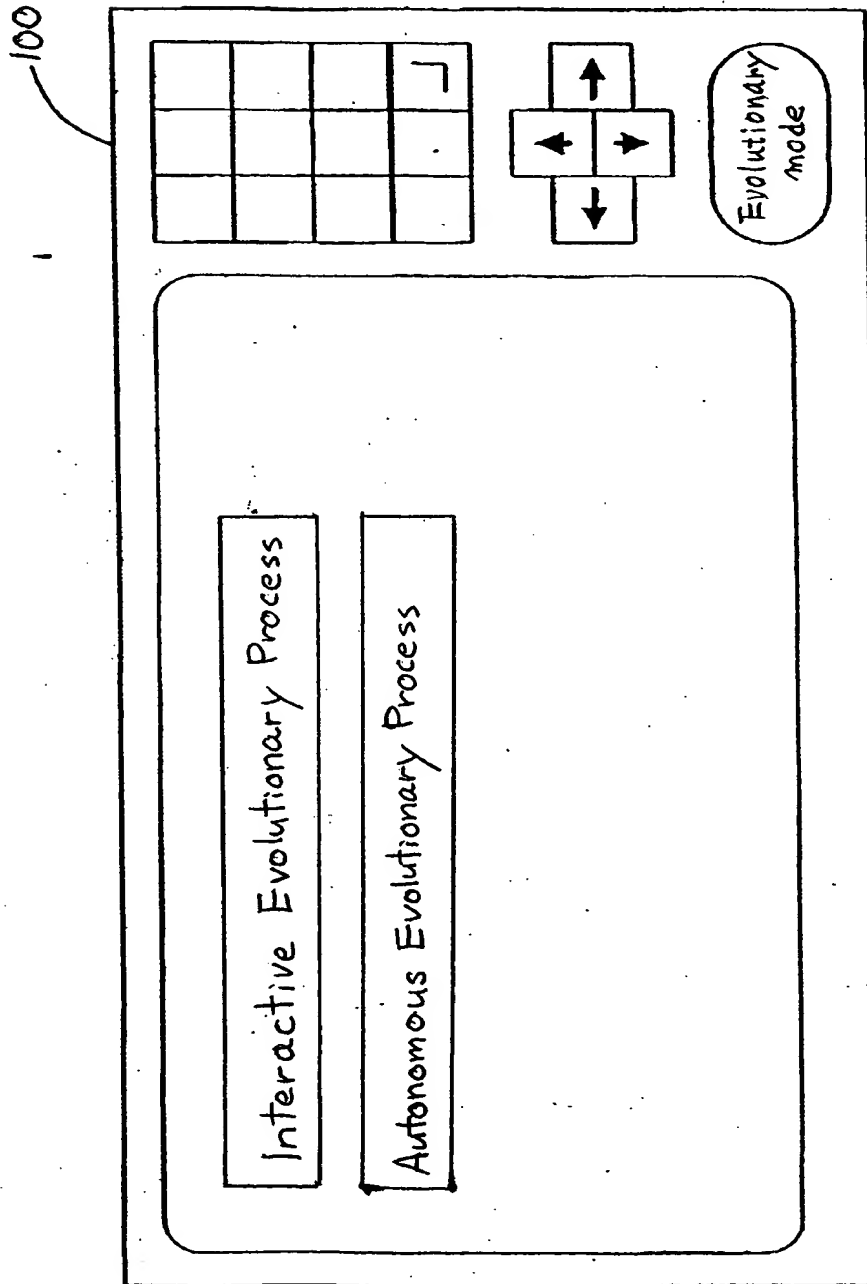Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A

Speed
[km/h]

Resistance variation due to
disturbance
[%]

Time

Navigation Pattern

1 cycle

a(1) a(2) a(3) a(4) a(5) a(6) a(7) a(8) a(9) a(10) a(1) a(2) a(3) a(4) a(5) a(6)

60
50
40
50
0
-50

FIG. 9

FIG. 10

Speed

Acceleration	FAST	MID	SLOW
PL	0.02	1.87	0.27
PS	4.96	8.39	3.72
ZR	12.61	① 86.42	③ 35.48
NS	9.55	② 49.75	④ 22.37
NL	8.96	18.19	2.44

Total table

Add →

Speed

Acceleration	FAST	MID	SLOW
PL			
PS		0.42	0.28
ZR		0.18	0.12
NS			
NL			

Fitness table

FIG. 11

Replacement Sheet

*APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY*
KAJI, et al.
Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A
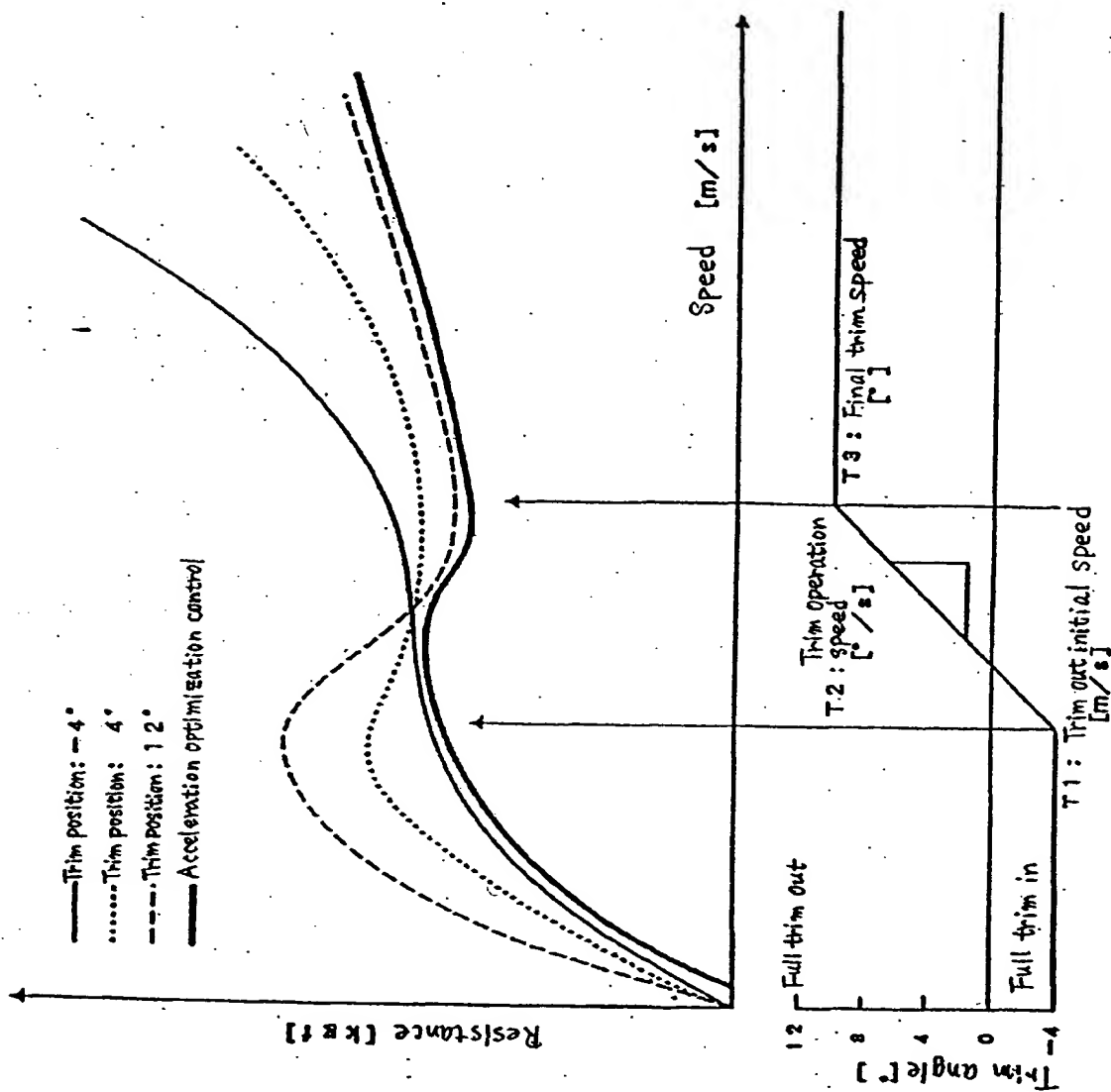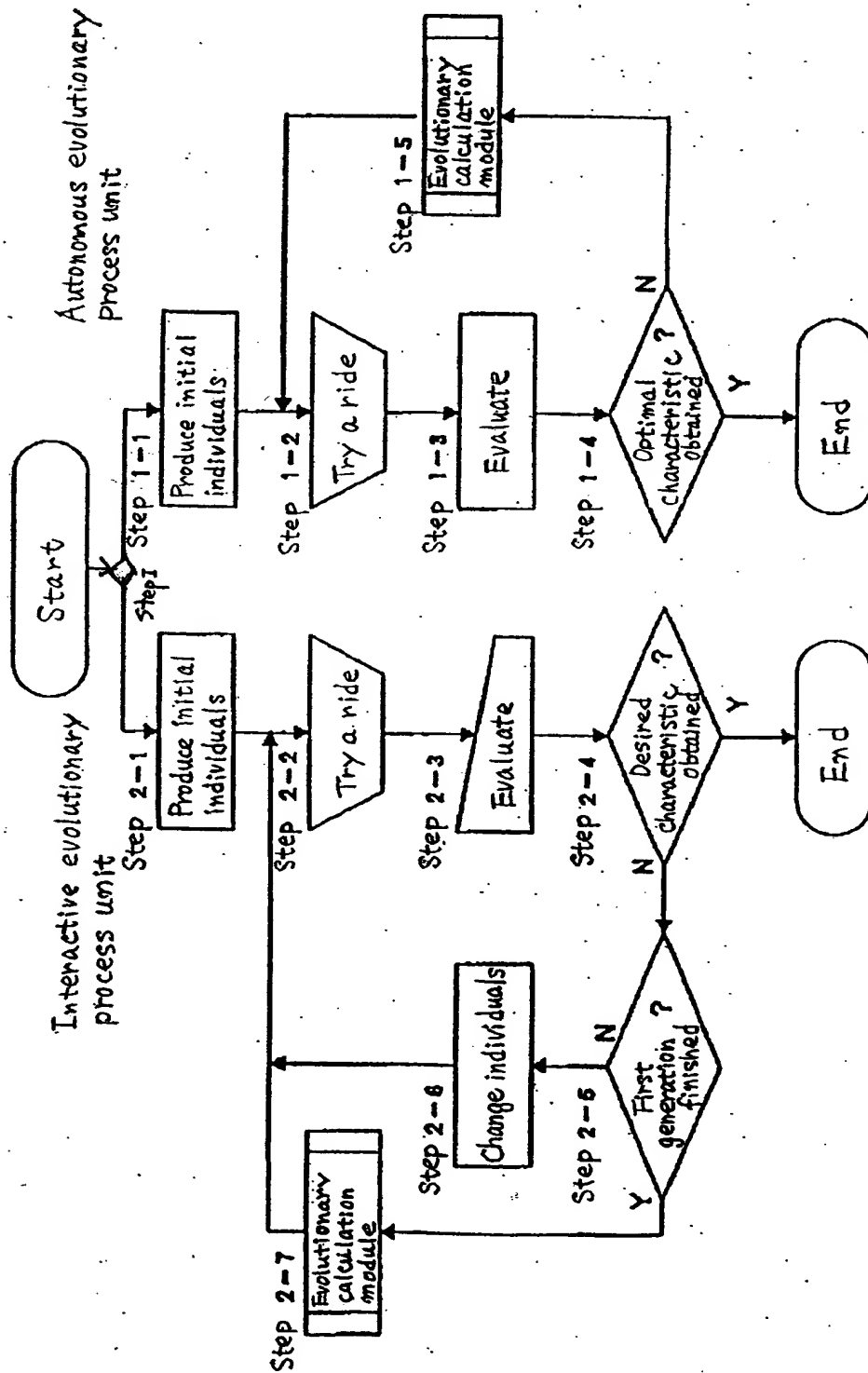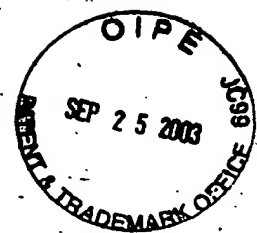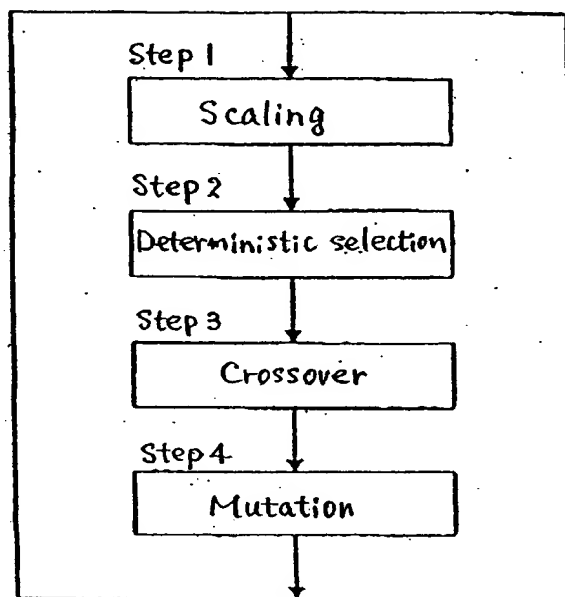
FIG. 12

FIG. 13

Autonomous evolutionary
process unit

Start

Step 1

Step 1-1
Produce initial individuals

Step 1-2
Try a ride

Step 1-3
Evaluate

Step 1-4
Optimal characteristic obtained ?

N
Y

Step 1-5
Evolutionary calculation module

End

Interactive evolutionary
process unit

Step 2-1
Produce initial individuals

Step 2-2
Try a ride

Step 2-3
Evaluate

Step 2-4
Desired characteristic obtained ?

Y
N

End

Step 2-5
First generation finished ?

N
Y

Step 2-6
Change individuals

Step 2-7
Evolutionary calculation module

FIG. 14

Evolutionary computation module (GA)

Step 1
Scaling

Step 2
Deterministic selection

Step 3
Crossover

Step 4
Mutation

F I G. 15

Evolutionary computation module (ES)

Step 1
Select deterministically
in order of good evaluation
values

Step 2
Crossover
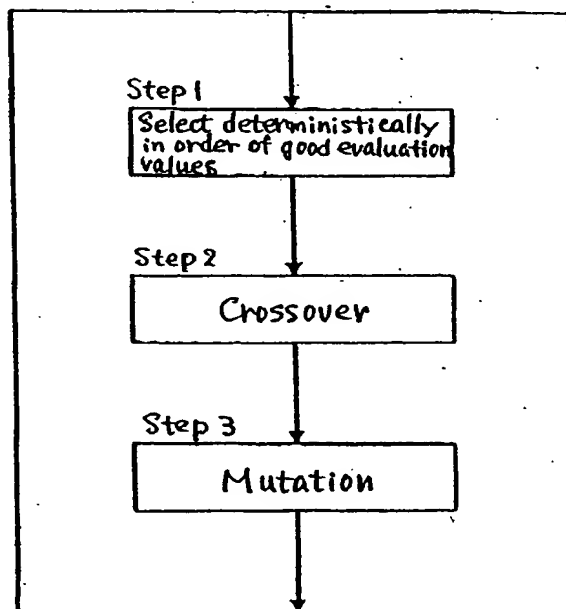
Step 3
Mutation

F I G. 16

Replacement Sheet

*APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY*
KAJI, et al.
Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A
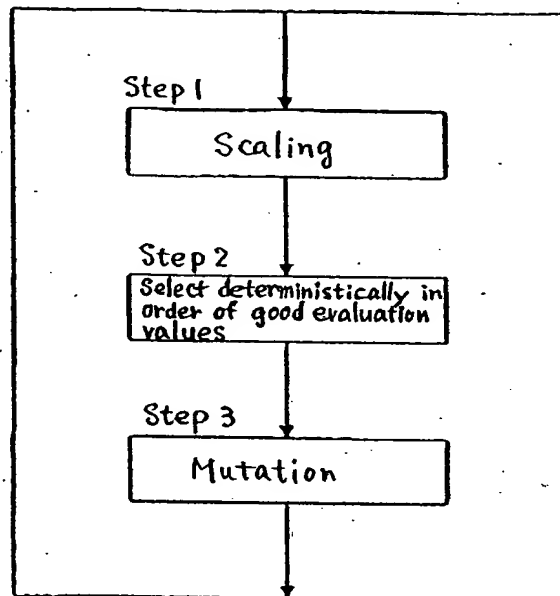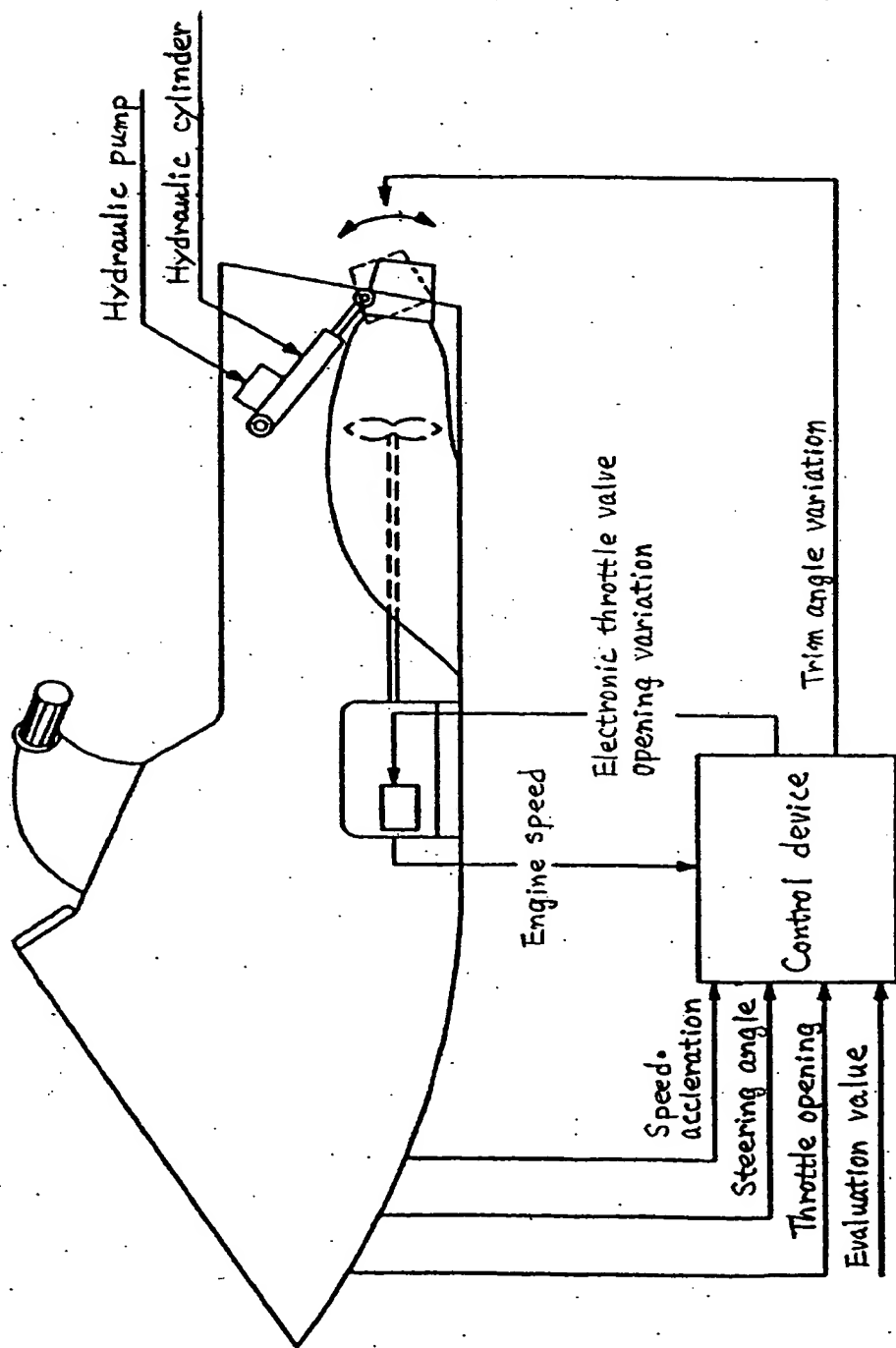
Evolutionary computation module (EP)

Step 1

Scaling

Step 2

Select deterministically in
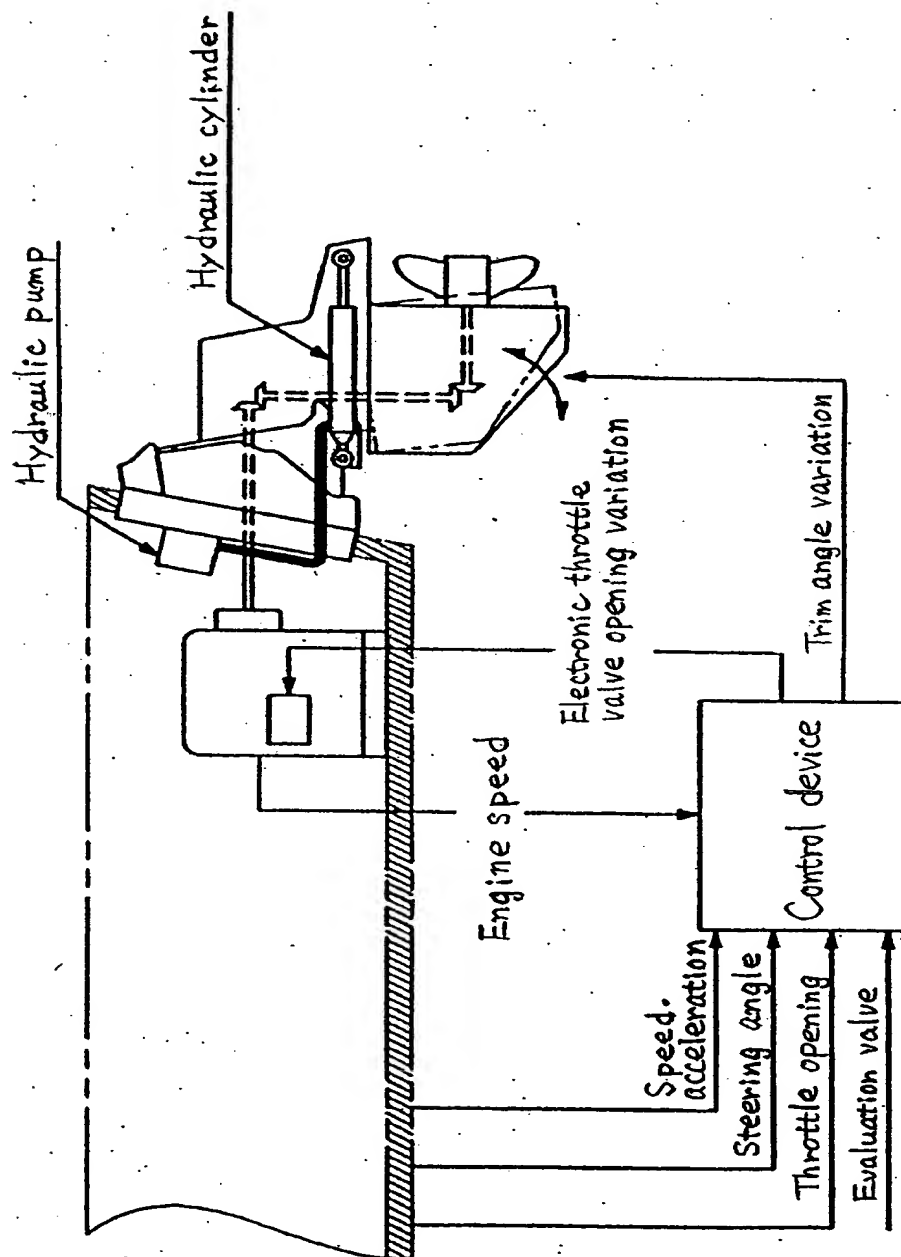order of good evaluation
values

Step 3

Mutation

FIG. 17

FIG. 18

Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
KAJI, et al.
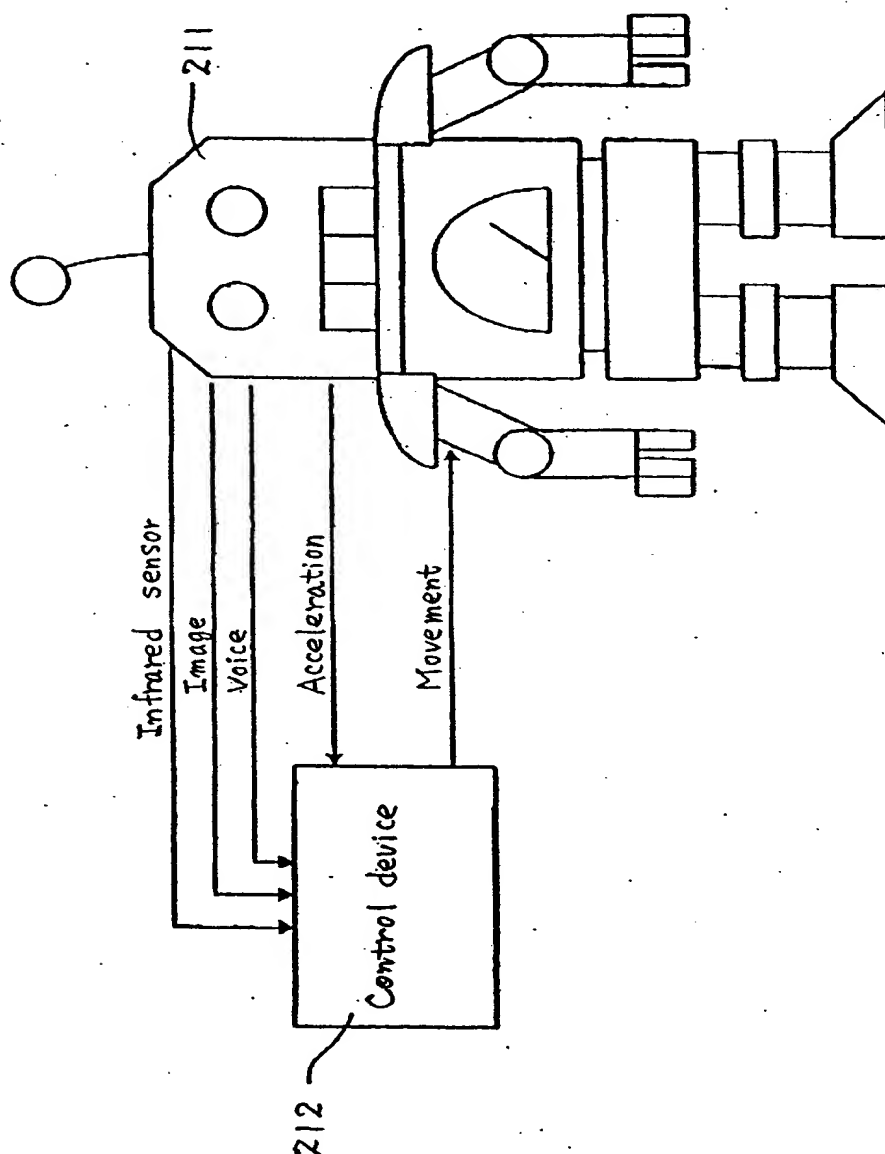*Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A*

Hydraulic cylinder

Hydraulic pump

Electronic throttle valve opening variation

Trim angle variation

Engine speed

Control device

Speed. acceleration

Steering angle

Throttle opening

Evaluation value

FIG. 19

FIG. 20

FIG. 21

221

222

Infrared sensor

Image

Voice

Acceleration

Movement

Control device

223

FIG. 22

Replacement Sheet

APPARATUS FOR OPTIMIZING CONTROL SYSTEM OF UNIT
DEVICE INTEGRATED IN MACHINE ASSEMBLY
KAJI, et al.
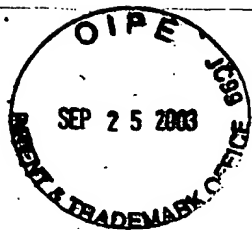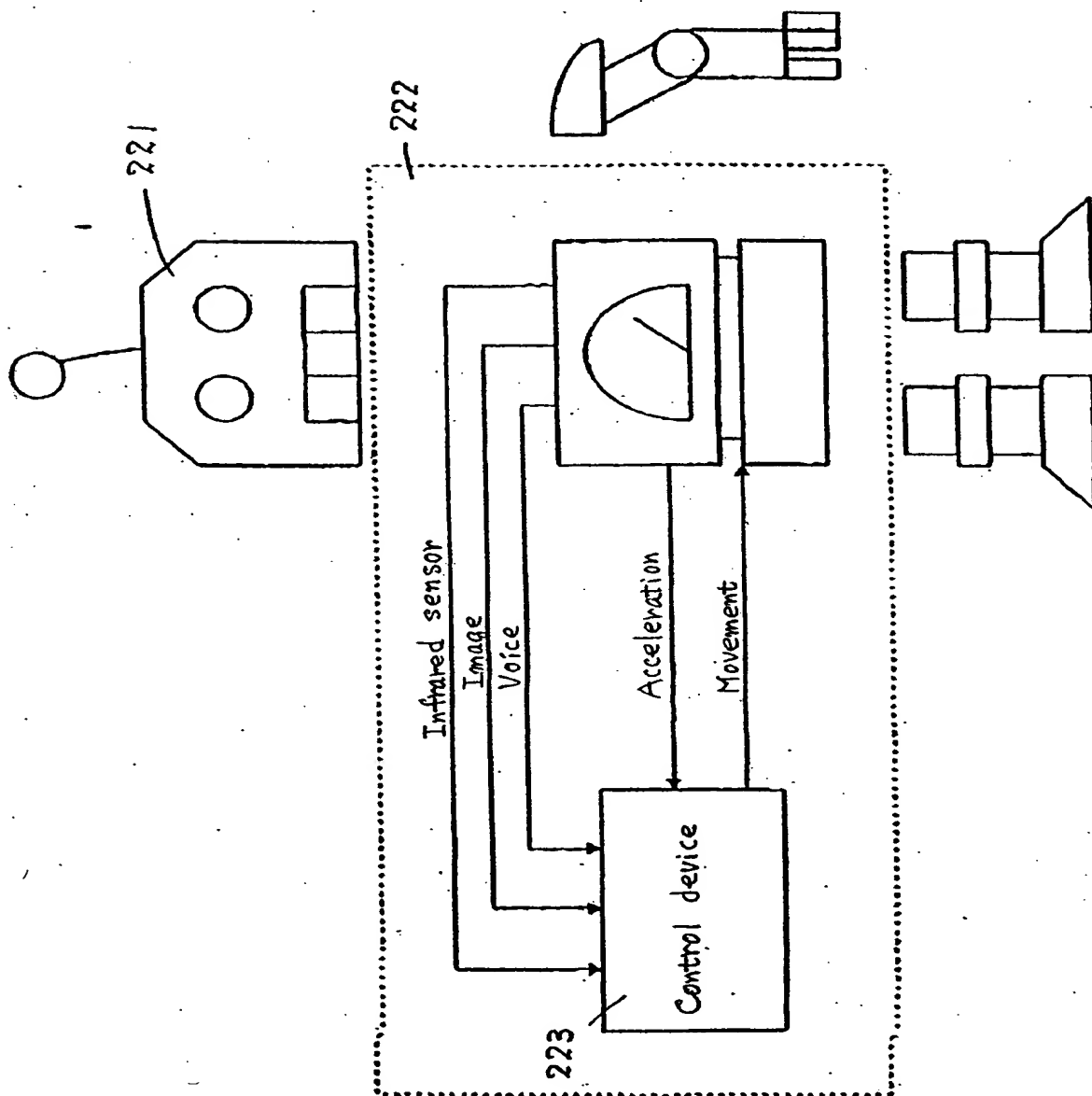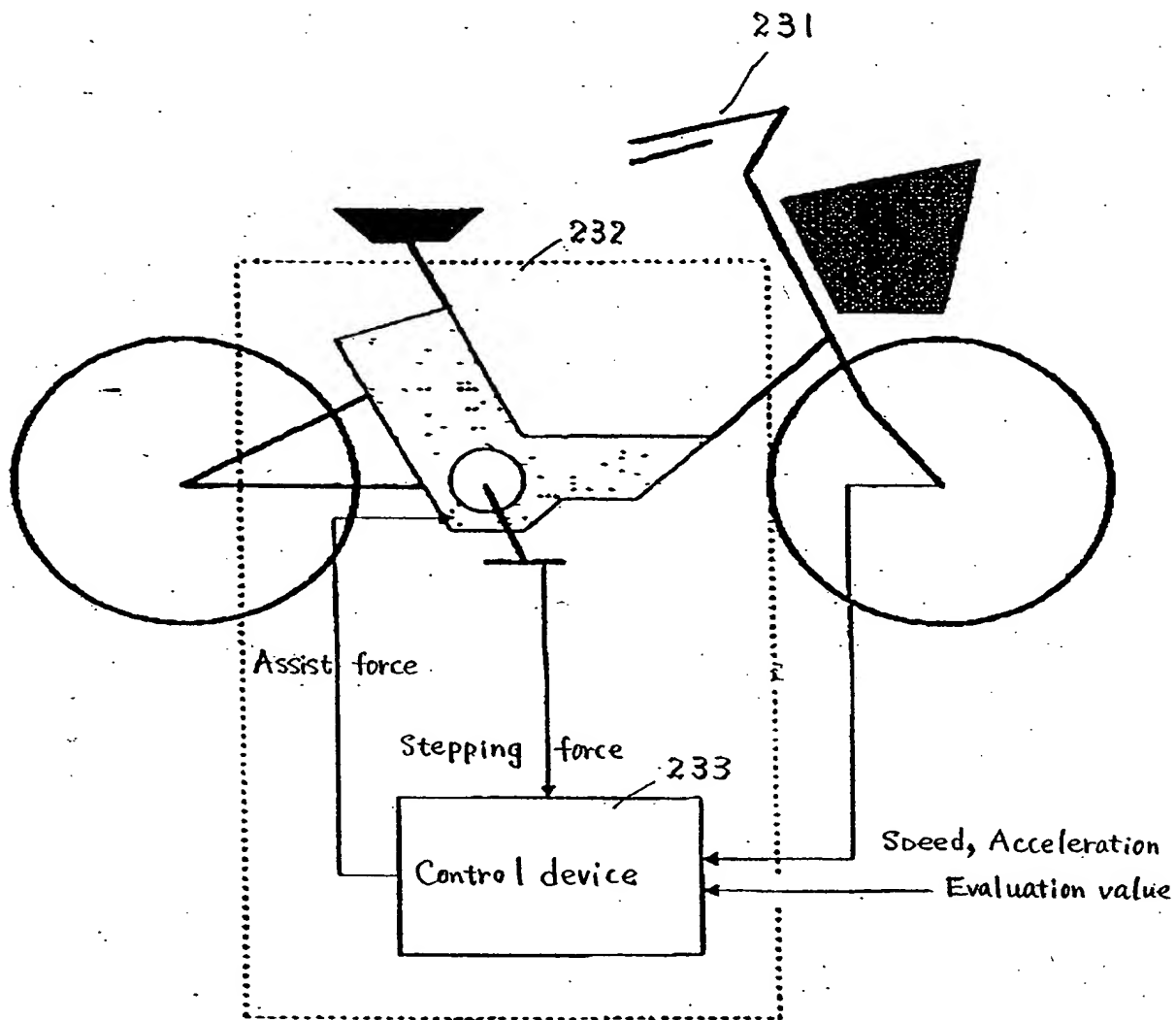*Appl. No.: 09/727,424   Atty Docket: YAMAH5.970A*

231

232

Assist force

Stepping force   233

Control device

Speed, Acceleration

Evaluation value

FIG. 23